

### 分布式小卫星SAR多普勒解模糊成像

杨磊\* 张磊 唐禹 邢孟道 保铮\*

西安电子科技大学雷达信号处理国家重点实验室 西安 710071

## Doppler Ambiguity Suppression SAR Imaging Using Distributed Micro Satellites

Yang Lei Zhang Lei Tang Yu Xing Meng-dao Bao Zheng\*

Key Laboratory for Radar Signal Processing, Xidian University, Xi'an 710071, China

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**摘要** 该文结合实际卫星轨道及地球自转特性,研究利用分布式小卫星丰富的空域信息解多普勒模糊,从而解决宽场景成像和方位高分辨之间的矛盾。提出建立子孔径坐标系,解决地球自转引起的星间回波不一致性并简化椭圆轨道的几何复杂性。建立子孔径坐标系包括两方面:一是将成像几何模型转换到地球固定坐标系下分析,此时地面场景静止,卫星轨道等效旋转;二是分孔径处理,针对每个子孔径建立坐标几何,经过误差补偿后小卫星轨道构型等效为固定基线且平行。对每个子孔径回波数据分别进行空域滤波解模糊处理后再进行孔径拼接,同时结合传统星载SAR成像算法实现大场景高分辨成像。最后以CARTWHEEL模型为例进行仿真,验证了该方法的有效性。

**关键词:** 分布式小卫星 合成孔径雷达 宽测绘带 多普勒解模糊 子孔径坐标系

**Abstract:** This paper focuses on the generation of wide-swath and high azimuth resolution image with the constellation of micro satellites in the condition of considering the effects of satellite ellipse orbit and earth rotation. The method of coordinate equivalent transformation to overcome the geometric complexity from ellipse orbit and earth rotation is proposed, which includes two aspects: the first is the transformation from earth inertial coordinate to earth fixed coordinate. In this way, the illuminated swath is still and the location vectors of satellites are equivalent rotating. The second is separation of the whole aperture into several sub-apertures and building the relative coordinates in which parallel tracks with constant baseline are obtained and the involved approximation error is numeric analyzed. The Doppler ambiguity is suppressed in every sub-aperture coordinate. Through assembling the sub-apertures, conventional algorithm can be applied to focus the wide-swath and high resolution image. Setting CARTWHEEL as an example, numeric simulation result confirms the validity of the method.

**Keywords:** Distributed micro satellite SAR Wide swath Doppler ambiguity suppression Sub-aperture coordinate

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通讯作者: 杨磊 Email: xdthomasyl@gmail.com

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